PAPER

IN

POLITE ARTS.

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The SILVER MEDAL of the Society was this Session voted to JOHN CHURCHMAN, Esq. Member of the Imperial Academy of Sciences at St. Petersburgh, for his GEOGRAPHICAL and TOPOGRAPHICAL IMPROVEMENTS.

The following COMMUNICATION was received from him, and an explanatory ENGRAVING is hereunto annexed.

SIR,

I REQUEST you to lay the following Essay on the Improvement of Geography before the Society for the Encouragement of Arts; and, in so doing, you will much oblige

Your most obedient servant,

JOHN CHURCHMAN.

No. 5, John-street, Tottenham-court-road,
March 8, 1804.

CHARLES TAYLOR, Esq.

It

It appears to be a matter of much importance to the people of any country, at all times, whether in war or peace, to possess a complete knowledge of its surface. In war, such knowledge is absolutely necessary for defence; in peace, for improving the country to the best advantage.

Now, since Geography may be improved, an easy and accurate method to lay down maps of mountainous countries and hilly estates, will perhaps prove useful, as it will show at a single view the true shape and comparative height of the ground without the art of painting.

As mountains are apt to eclipse each other, a perspective view is seldom very extensive, the rules of which fall short of giving an accurate idea of any hilly country; because such a view, though strictly true in one particular place, is not so in any other. The altitudes

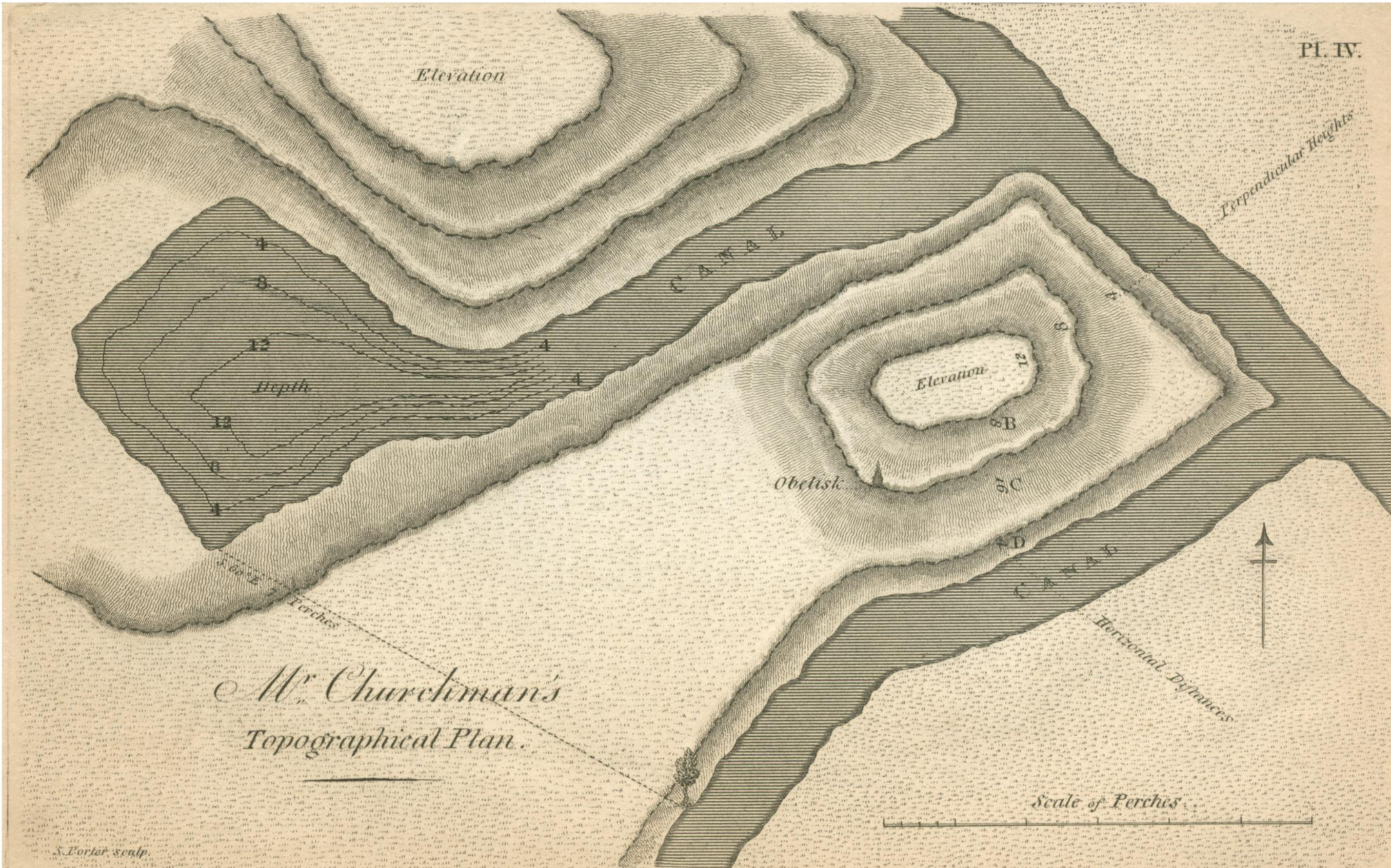
tudes of mountains appear in proportion to the distance from the eye, and no rule in geometry has been found sufficient to determine distances from any single station. Neither can a bird's-eye view of an estate ascertain the depth of valleys or the height of mountains. But the method here proposed will be found equally capable of giving the true shape of any ground above or below water. It may be successfully applied to sea charts, and will prevent much confusion, arising from the tedious method of distinguishing soundings by a multitude of figures.

EXPLANATION.

Suppose a full description is required of any island in the ocean. First, let an accurate map be laid down in the common way; and let the perpendicular height between the highest point of land and the ocean be divided into any number of equal parts. Suppose these equal

equal divisions are 100, 200, 300, 400 feet above the low-water mark. From the different points of these several divisions, let horizontal lines be run with a good theodolite, and spirit level annexed, all round the island. If the work is well done, each line will end where it began; and if the bearings and distances of these several lines are truly laid down on the map, the crooked courses of them will clearly show the shape of the ground over which they pass. For example: if any horizontal line passes by the side of a steep hill, it will incline towards the ocean, or approach the next horizontal line below it. When the same line crosses a stream of running water or a valley, it will naturally bend up the side of the said stream, until it can cross it without losing the level; or, in other words, it will bend towards the centre of the island. Hence, by a little practice, the shape of the several horizontal lines on the

Pl. IV.



Mr. Churchman's
Topographical Plan.

S. Porter sculp.

the map will give as clear an idea to the mind, of the shape of any country over which they pass, as a sight of the country itself can convey to the eye. But to obtain a mathematical and true knowledge of the altitude and declivity of any part of the country, we have the following proposition:—

As the perpendicular height of any one horizontal line above another is to the radius: so is the horizontal distance between the horizontal lines measured on the map at any particular place: to the co-tangent of declivity at that place.

Note.—If the horizontal distance between any two horizontal lines on the map is equal to the perpendicular height of any horizontal line above another, the angle of altitude, or declivity, of any hill will be 45 degrees.

The present improvement, which I believe to be entirely new, will be found to possess the following advantages:—

1st. Military men are well acquainted with

with the many advantages always to be gained from the exact representation of high grounds. By this method, we are able to give the angle of altitude, the angle of declivity, and perpendicular height of every hill; likewise the comparative height of different hills, the best route by which the high grounds may be gradually ascended, and where heavy burthens can be drawn up with most ease.

2dly. Experience has sufficiently shown, that the inhabitants of low grounds are subject to different kinds of sickness, from which those living at places elevated to a certain degree are exempt. A map on this improved plan will point out the most proper situation for building dwelling-houses. It will be useful in Botany, in discovering or cultivating some kinds of plants which flourish best at particular distances above the level of the ocean. It will trace the line of vegetation on the sides of

of lofty mountains, whose tops are coveed with eternal snow.

3dly. Some high lands are known to produce good grain, while low lands afford grass more abundantly; but most grounds produce good grass, over which a moderate quantity of running water is conveyed. A plan of any country in this way will show all the ground that can be irrigated; where water-works may be erected; where navigable canals may be cut; and where highways and rail-roads may be laid out on the best and most level ground.

4thly. The subterraneous treasures of the mineral and fossil kingdoms are generally found in strata; and if they are not truly horizontal, they make a certain angle with the horizon. A map on this projection may enable the mineralogist to follow any one stratum, at places even far distant from each other.

PROBLEM.

To find the true declivity of any piece of ground, in any map laid down on the principles of the present plan.

Example 1st. for D. see plate 4.

As the perpendicular height, 4 feet -	60206
Is to radius, 90° - - - - -	10.00000
So is the horizontal distance, 4 feet -	60206
	10.60206
To the co-tangent of the declivity, 45°	10.00000

Example 2d. for B.

As the perpendicular height, 4 feet -	60206
Is to radius, 90° - - -	10.00000
So is the horizontal distance, 8 feet -	90309
	10.90309
To the co-tangent of the declivity, 26° 34′ - - - -	10.30103

Example 3d. for C.

As the perpendicular height, 4 feet -	60206
Is to radius, 90° - - - - -	10.00000
So is the horizontal distance, 18 feet	1.25527
	11.25527
To the co-tangent of the declivity, 12° 32′ - - - -	10.65321

The

The annexed survey, Plate IV. of a small lake and artificial mountain in the garden of his Excellency Count de Strogonoff, near St. Petersburgh, has been closed by the tables of the difference of latitude and departure, as follows:

		N	S	E	W
N 30 E	2½	2.2	—	1.2	—
N 35 E	2	1.6	—	1.1	—
N 75 E	2	.5	—	1.9	—
N 55 E	2	1.1	—	1.6	—
N 45 E	3	2.1	—	2.1	—
N 52 W	2	1.2	—	—	1.6
N 59 W	3	1.5	—	—	2.5
S 56 W	12	—	6.7	—	9.9
S 60 E	7	—	3.5	6.1	—
		10.2	10.2	14.0	14.0